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⁂ An excellent solution was received from Professor Zerr. He takes the horizontal line on which the wheel travels as the x-axis, and gets for the equation of the path of the fly,

$$x=a\theta\left(1-\frac{\sin\theta}{2n\pi}\right),\ y=a\left(1-\frac{\theta\cos\theta}{2n\pi}\right),\ \text{for required length.}$$

$$s=a\int_0^{2\pi/m}\sqrt{1+\frac{1+\theta^2}{4\pi^2n^2}-\frac{\sin\theta+\theta\cos\theta}{\pi n}}\,d\theta. \qquad \text{F.}$$

192. Proposed by G. B. M. ZERR, A. M., Ph. D., Parsons, W. Va.

Show that the volume V of the hyper-ellipsoid with semi-axes a_1, a_2, a_3, a_4, etc., in space of $2n$ and $2n+1$ dimensions is

$$V_{2n}=\frac{a_1.a_2.a_3\ldots\ldots a_{2n}.\pi^n}{1.2.3.4.5\ldots\ldots\ldots\ldots n};\quad V_{2n+1}=\frac{2^{n+1}.a_1.a_2.a_3\ldots\ldots\ldots a_{2n+1}.\pi^n}{1.3.5.7.9\ldots\ldots\ldots\ldots(2n+1)}.$$

Solution by the PROPOSER.

Let $\left(\frac{x_1}{a_1}\right)^2+\left(\frac{x_2}{a_2}\right)^2+\left(\frac{x_3}{a_3}\right)^2+\ldots\ldots+\left(\frac{x_r}{a_r}\right)^2=1$ be the equation to the hyper-ellipsoid. Then its volume is $V=2^r\int\int\int\ldots\ldots dx_1\,dx_2\,dx_3\ldots\ldots dx_r$.

Let $x_1/a_1=y_1$, $x_2/a_2=y_2$, ..., $x_r/a_r=y_r$.

$\therefore V=2^ra_1a_2a_3\ldots\ldots a_r\int\int\int\ldots\ldots dy_1\,dy_2\,dy_3\ldots\ldots dy_r$, subject to the condition, $y_1^2+y_2^2+y_3^2+\ldots\ldots+y_r^2=1$.

$\therefore V=\dfrac{a_1a_2a_3\ldots\ldots a_n[\Gamma(\frac12)]^r}{\Gamma(1+\frac12r)}$.

When $r=2n$,

$$V=\frac{a_1a_2a_3\ldots\ldots a_{2n}\,\pi^n}{1.2.3.4\ldots\ldots n}.$$

When $r=2n+1$,

$$V=\frac{a_1a_2a_3\ldots\ldots a_{2n+1}\,\pi^n\,\Gamma(\frac12)}{\frac12.\frac32.\frac52\ldots\ldots\frac{2n+1}{2}\Gamma(\frac12)}=\frac{2^{n+1}a_1a_2a_3\ldots\ldots a_{2n+1}\,\pi^n}{1.3.5.7.9\ldots\ldots(2n+1)}.$$

193. Proposed by F. P. MATZ, Sc. D., Ph. D., Reading, Pa.

Find the eccentricity of the maximum semi-ellipse inscribed in a given isosceles triangle.

I. Solution by G. B. M. ZERR, A. M., Ph. D., Parsons, W. Va., and J. SCHEFFER, Hagerstown, Md.

Let the mid-point of the base be the origin, a=altitude, b=base of triangle. Let $x^2/m^2+y^2/n^2=1$ be the ellipse. Then πmn=maximum.

$\therefore n/m=y/x$.